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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/829,876	04/10/2001	Shuichi Kikuchi	10417-076001	7681
26211	7590	11/03/2003		
FISH & RICHARDSON P.C. 45 ROCKEFELLER PLAZA, SUITE 2800 NEW YORK, NY 10111			EXAMINER OWENS, DOUGLAS W	
			ART UNIT	PAPER NUMBER
			2811	

DATE MAILED: 11/03/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/829,876

Applicant(s)

KIKUCHI ET AL.

Examiner

Douglas W Owens

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 18 August 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 1-4 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 5-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_ 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on August 18, 2003 has been entered.

### ***Specification***

2. The disclosure is objected to because of the following informalities:

In line 5 of page 6, "concentrate" should be replaced with "concentration".

The word "volume" should be replaced with "dose" in the following places, for example, since a volume cannot be described in terms of cm<sup>2</sup>: Page 12, line 21; page 13, line 23; page 15, line 8; page 16, line 16.

The phrase "gate electrode 7" should be replaced with "first gate insulation 4" in at least the following places: Page 11, lines 15 and 21; page 14, line 12.

Lines 10 – 13 of page 10 are incomprehensible.

Lines 10 – 13 of page 13 doesn't appear to be written in a manner that the content can be understood.

Appropriate correction is required.

### ***Claim Objections***

3. Claims 8 – 18 and 20 are objected to because of the following informalities:

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Claim 9 recites the limitation, "...wherein phosphorus ion is implanted..." The word "ion" should be deleted or "ion is" should be replaced with "ions are". Claim 10 recites the same limitation.

Claim 8 recites the limitation, "...the high impurity concentration being low at a region near surface of the substrate...". The high impurity concentration region cannot also be a low impurity concentration region. Is it the applicant's intention to claim a high impurity concentration region with a low impurity concentration region adjacent the high impurity concentration region, wherein the low impurity concentration region is closer in proximity to the upper surface of the substrate? Alternatively, is it the Applicant's intention to claim a region with a graded impurity concentration that decreases toward an upper surface of the substrate?

Claims 10, 12, 14, 16, 18 and 20 are objected to since they depend from objected base claim 8 and accordingly include all limitations thereof.

Claim 11 recites the limitation, "...ion implantation is carried out at a region...". The word "at" should be replaced with "in". Claims 12 – 14 recite similar limitations.

Claim 15 recites the limitation, "...wherein said layer is formed at a region...". The word "at" should be replaced with "in". Claims 16 – 18 recites similar limitations.

Claim 13 recites the limitation "...using a side wall insulation film formed at a side wall portion...". The word "at" should be replaced with "adjacent" or a similar term that describes the position of the side wall insulation film.

Appropriate correction is required.

***Claim Rejections - 35 USC § 112***

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 7 – 20 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claim 7 requires that the layer of the first conductivity type span from one end of the gate insulation film to the third drain region. The impurity layer (11A, B, C) extends beyond the third drain region (10) as opposed to only extending to the third drain. Additionally, the impurity layer does not span from one end of the first gate insulation film. The impurity layer spans from a predetermined distance (L) away from an end of the first gate insulation film.

Claims 9, 11, 13, 15, 17 and 19 are rejected as depending from rejected base claim 7.

Claim 8 requires that a high concentration be formed, wherein the high impurity concentration layer (11A, 11B, 11C) spans from one end of the first gate insulation (4) to the third drain region (10) and the high impurity concentration region is low near a surface of the substrate. There is no support for these limitations in the disclosure. The region 11A, 11B and 11C is described as having a "middle concentration" (page 16, line 25; page 18, line 23). Additionally, the impurity layer (11A, B, C) extends beyond the

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third drain region (10) as opposed to only extending to the third drain. There is also no mention in the disclosure of the impurity layer 11 having a graded concentration or a layer above it having a lower impurity concentration. Furthermore, the impurity layer does not span from one end of the first gate insulation film. The impurity layer spans from a predetermined distance (L) away from an end of the first gate insulation film.

Claims 10, 12, 14, 16, 18 and 20 are rejected as being dependent from rejected base claim 8.

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 5 – 20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 5 requires that the impurity be diffused "...through a first gate insulation film formed on the semiconductor substrate by applying a heat treatment...". The scope of the claimed subject matter is nebulous since it cannot be determined from the claim if the impurity is transported through the first gate insulation film or if the gate insulation film serves some role in the heat treatment, such as a thermal interface.

Claim 5 recites the limitation, "...wherein first and second drain regions are formed by a single step of implanting the impurity and forming the first gate insulation by applying heat treatment...". The scope of the claimed subject matter cannot be determined since it is not known if the single step includes the two steps of implanting and applying a heat treatment. It is not known if the first and second drain regions are

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formed simultaneously with the first gate insulation. Does the same heat treatment form the drain regions and the first gate insulation film? If this is the intended scope of the claim, there doesn't appear to be support for this limitation in the specification.

Claims 6 – 20 are rejected as being dependent from rejected base claim 5.

***Claim Rejections - 35 USC § 102***

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. Claims 5 – 7 and 19 are rejected under 35 U.S.C. 102(b) as being anticipated by US patent No. 5,578,514 to Kwon et al.

Regarding claim 5, Kwon et al. teaches a method of making a semiconductor device comprising the steps of:

implanting an impurity of a first type (23) in a semiconductor substrate (12) of a second type in a single implantation step;

providing a first gate insulation film (26);

diffusing the implanted impurity (Col. 2, line 65 – Col. 3, line 9);

providing a second gate insulation film (30) on the substrate in a different location than the first gate insulation film;

providing a gate electrode (32) that spans from the first gate insulation film to the second gate insulation film;

providing a source region (34) of the first conductivity type; and

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providing a third drain region (36) of the first conductivity type.

Kwon et al. does not explicitly teach that the impurity region is diffused such that a first drain region is formed, with a second drain region having a different concentration than the first drain region and further, where the second drain region is above the first drain region. Kwon et al. teaches performing a thermal step for the purpose of diffusion drive in after the implantation step. Kwon et al. discloses that the diffusion drive in step is performed at approximately 1100° C for approximately 120 – 240 minutes (Col. 3, lines 6 – 10). The Applicant discloses that diffusing a first implant forms the first and second drain regions. The method taught by Kwon et al. would have inherently resulted in a device having first and second drain regions as claimed in the instant application since the steps performed subsequent to the implant are nearly identical.

Regarding claim 6, Kwon et al. does not explicitly teach that providing the first and second drain comprises diffusing impurities from the first gate insulating film. The method taught by Kwon et al. would have inherently resulted in impurities being diffused from the first gate insulating film since the method is nearly identical to that of the claimed invention.

Regarding claim 7, Kwon et al. teaches a method further comprising:

providing a layer of the first conductive type (14) to span from one end of the first gate insulation film to the third drain region.

Regarding claim 19, Kwon et al. does not explicitly teach a first drain region that has a lower impurity concentration than the second drain region. The method taught by Kwon et al. would have inherently resulted in a first drain region with a lower impurity



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concentration than the second drain region since the method is the nearly identical to that of the claimed invention.

***Response to Arguments***

10. Applicant's arguments filed August 18, 2003 have been fully considered but they are not persuasive.

The Applicant argues that Kwon et al. does not show drain regions with different impurity concentrations. Kwon et al. teaches performing an implant (23) and then diffusing the implant via a thermal process to complete formation of the drain region (24), which is the same method disclosed in the instant application to form two drain regions having different concentrations. It is seen as being inherent that the method taught by Kwon et al. would have produced two drain regions having different concentrations since the method is nearly identical to that of the claimed invention. Kwon et al. further teaches forming a third drain region (36) in a separate implantation step.

The Applicant further argues that Kwon et al. does not teach the step of diffusing the implanted impurity through the first gate insulation film. Although, it is not clear what the intended meaning of this limitation is, Kwon et al. does indeed teach forming the first gate insulation film and then performing a thermal step to diffuse to the impurity in a method nearly identical to that of the claimed invention (See Kwon, Col. 2, line 65 – Col. 3, line 10).

The Applicant correctly asserts that drain regions 24 and 36 are formed in different implantation steps. However, drain region 24 is formed in the same manner as

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that of the claimed invention. According to the Applicant's disclosure, this method of forming the drain would have resulted in a first and second drain region. Although the second drain region is not shown in the figures by Kwon et al., it would have inherently been present because of the identical processing steps.

The Applicant argues that the epitaxial layer (14) of Kwon et al. still exists when the thick insulator (26), corresponding to the Applicant's first gate insulator (4), is formed. The epitaxial layer is merely a layer of high quality silicon to form the devices in, so the point of the Applicant's argument is not clear to the Examiner. Moreover, Kwon et al. further teaches diffusing the impurities in a step separate from the step of forming the first gate insulation film (Col. 3, lines 6 – 9), as claimed in the instant application.

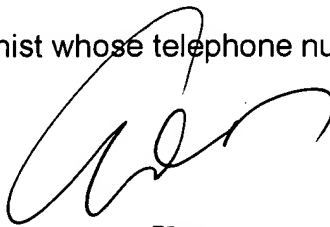
### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Douglas W Owens whose telephone number is 703-308-6167. The examiner can normally be reached on Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C Lee can be reached on 703-308-1690. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-3900.

DWO



EDDIE LEE  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2800